U.S. Department of Transportation
Office of the Secretary of Transportation

DTRS57-01-R-SBIR

PROGRAM SOLICITATION

Small Business Innovation Research Program

Closing Date: May 1, 2001

DOT SBIR Program Office, DTS-22
U.S. Department of Transportation
Research and Special Programs Administration
John A. Volpe National Transportation Systems Center
55 Broadway, Kendall Square
Cambridge, MA 02142-1093

CONTENTS

SECTION ..... PAGE

I. PROGRAM DESCRIPTION 1

II. DEFINITIONS 3

III. PROPOSAL PREPARATION INSTRUCTIONS AND REQUIREMENTS 5

IV. METHOD OF SELECTION AND EVALUATION CRITERIA 8

V. CONSIDERATIONS 10

VI. SUBMISSION OF PROPOSALS 14

VII. SCIENTIFIC AND TECHNICAL INFORMATION SOURCES 15

VIII. RESEARCH TOPICS 16

IX. SUBMISSION FORMS AND CERTIFICATIONS 26

APPENDICES

A. PROPOSAL COVER SHEET 27

B. PROJECT SUMMARY 28

C. CONTRACT PRICING PROPOSAL 29

D. PROPOSAL CHECKLIST 32

E. PROPOSAL ACKNOWLEDGEMENT FORM 33

DOT PROGRAM SOLICITATION FOR SMALL BUSINESS INNOVATION RESEARCH

I. PROGRAM DESCRIPTION

A. Introduction

This solicitation for research proposals is issued by the Department of Transportation (DOT) pursuant to the Small Business Innovation Development Act of 1982, P.L. 97-219, as amended by P.L. 99-443, and P.L. 102-564, Small Business Research and Development Act of 1992, signed October 28, 1992. On December 15, 2001, Congress reauthorized the Program by P.L. 106-554. The law seeks to encourage the initiative of the private sector and to use small business as effectively as possible in meeting Federal research and development objectives.

The purposes of the Act are:

(1) To stimulate technological innovation;
(2) To use small business to meet Federal research and development needs;
(3) To increase private sector commercialization of innovations derived from Federal research and development; and
(4) To foster and encourage minority and disadvantaged participation in technological innovation.

In consonance with the statutory obligations of the Act, the U.S. Department of Transportation has established a Small Business Innovation Research Program - hereinafter referred to as the DOT SBIR Program.

The purpose of this solicitation is to invite small businesses with their valuable resources and creative capabilities to submit innovative research proposals that address high priority requirements of the Department.

B. Three-Phase Program

The DOT SBIR Program is a three-phase process. **THIS SOLICITATION IS FOR PHASE I PROPOSALS ONLY**.

Phase I. Phase I is for the conduct of feasibility-related experimental or theoretical research or Research & Development (R&D) efforts on research topics as described herein. The dollar value of the proposal may be up to $100,000 unless otherwise noted and the period of performance may be up to six months. The primary basis for award will be the scientific and technical merit of the proposal and its relevance to DOT requirements. **Only awardees in Phase I are eligible to participate in Phase II (by invitation only).**

Phase II. Phase II is the principal research or R&D effort having a period of performance of approximately two years with a dollar value of up to $750,000 unless otherwise noted. Phase II proposals must be prepared in accordance with guidelines provided by DOT to invited Phase I awardees. DOT will accept Phase II proposals under the DOT SBIR Program only from firms which have previously received a DOT Phase I award. Phase II awards will be based on results of Phase I efforts, technical merit, Agency priority and commercial applications, and the availability of appropriated funds to support the Phase II effort. Special consideration may be given to proposals that have obtained commitments for follow-on funding from non-Federal sources for Phase III.

Phase III. Phase III is to be conducted by the small business with either non-Federal funds to pursue commercial applications of research or R&D funded in Phases I and II, or non-SBIR government funded contracts for continued research or products or processes intended for use by the United States Government.

C. Eligibility

Each concern submitting a proposal must qualify as a small business at the time of award of Phase I and Phase II funding agreements. In addition, **the primary employment of the principal investigator must be with the small business firm at the time of award and during the conduct of the proposed research** unless otherwise approved by the Contracting Officer. Primary employment means that

more than one-half of the principal investigator's time is spent with the small business. Also for both Phase I and Phase II, the research or R&D work must be performed in the United States. "United States" means the 50 states, the Territories and possessions of the United States, the Commonwealth of Puerto Rico, the Commonwealth of the Northern Mariana Islands, the Trust Territory of the Pacific Islands, and the District of Columbia.

All types of small business organizations may submit proposals, including high technology, R&D, manufacturing and service firms. Companies with outstanding scientific or engineering competence in highly specialized product, process or service areas may wish to apply their expertise to the research topics in this solicitation through a laboratory prototype. Ideally, the research shall make a significant contribution to the solution of an important transportation problem and provide the small business concern with the basis for new products, processes, or services.

D. General Information

This is a solicitation for Phase I research proposals on advanced, innovative concepts from small business firms having strong capabilities in applied science or engineering.

The Phase I research proposals shall demonstrate a sound approach to the investigation of an important transportation-related scientific or engineering problem categorized under one of the topics listed in Section VIII.

A proposal may respond to any of the research topics listed in Section VIII, but must be limited to one topic. The same proposal may not be submitted under more than one topic. An organization may, however, submit separate proposals on different topics, or different proposals on the same topic, under this solicitation. Where similar research is discussed under more than one topic, the proposer shall choose that topic which appears to be most relevant to the proposer's technical concept.

The proposed research must have relevance to the improvement of some aspect of the national transportation system or to the enhancement of the ability of an operating element of the DOT to perform its mission.

Proposals shall be confined principally to scientific or engineering research which may be carried out through construction and evaluation. Proposals must be for research or R&D, particularly on advanced or innovative concepts, and shall not be for incremental or scaled-up versions of existing equipment or the development of technically proven ideas. Proposals for the development of already proven concepts toward commercialization, or which offer approaches already developed to an advanced prototype stage or for market research shall not be submitted. Commercialization is the objective of Phase III, in which private capital or non-SBIR funds are to be used to continue the innovative research supported by DOT under Phase I and Phase II.

The proposal shall be self-contained and checked carefully by the proposer to ensure that all preparation instructions have been followed. (See proposal checklist)

Requests for additional information or questions relating to the DOT SBIR Program may be addressed to:

Joseph Henebury
DOT SBIR Program Director, DTS-22
U.S. Department of Transportation
Research and Special Programs Administration
John A. Volpe National
Transportation Systems Center
55 Broadway, Kendall Square
Cambridge, MA 02142-1093

Telephone: (617) 494-2051
Fax: (617) 494-2370
E-Mail Address: henebury@volpe.dot.gov
Volpe Center Web Site:
http://www.volpe.dot.gov/SBIR

II. DEFINITIONS

A. Research or Research and Development

Research or research and development (R or R&D) means any activity which is:

(1) A systematic, intensive study directed toward greater knowledge or understanding of the subject studied;

(2) A systematic study directed specifically toward applying new knowledge to meet a recognized need; or

(3) A systematic application of knowledge toward the production of useful materials, devices, and systems or methods, including design, development, and improvement of prototypes and new processes to meet specific requirements.

B. Small Business Concern

A small business concern is one that at the time of award of Phase I and Phase II funding agreements meets the following criteria:

(1) Is independently owned and operated, is not dominant in the field of operation in which it is proposing, and has its principal place of business located in the United States and is organized for profit;

(2) Is at least 51 percent owned, or in the case of a publicly owned business, at least 51 percent of its voting stock is owned by United States citizens or lawfully admitted permanent resident aliens;

(3) Has, including its affiliates, a number of employees not exceeding 500, and meets the other regulatory requirements found in 13 CFR Part 121. Business concerns, other than investment companies licensed, or state development companies qualifying under the Small Business Investment Act of 1958, 15 U.S.C. 661, et seq., are affiliates of one another when either directly or indirectly (A) one concern controls or has the power to control the other; or (B) a third party or parties controls or has the power to control both. Control can be exercised through common ownership, common management, and contractual relationships. The term "affiliation" is defined in greater detail in 13 CFR 121.401. The term "number of employees" is defined in 13 CFR 121.407. Business concerns include, but are not limited to, any individual, partnership, corporation, joint venture, association or cooperative.

C. Minority and Disadvantaged Small Business Concern

A minority and disadvantaged small business concern is one that is:

(1) At least 51 percent owned by one or more minority and disadvantaged individuals; or in the case of a publicly owned business, at least 51 percent of the voting stock of which is owned by minority and disadvantaged individuals; and

(2) Whose management and daily business operations are controlled by one or more such individuals.

A minority and disadvantaged individual is defined as a member of any of the following groups:

(1) Black Americans.

(2) Hispanic Americans.

(3) Native Americans.

(4) Asian-Pacific Americans.

(5) Subcontinent Asian Americans.

D. Women-Owned Small Business Concern

A women-owned small business concern is one that is a small business that is at least 51 percent owned by a woman or women who also control and operate it. "Control" in this context means exercising the power to make policy decisions. "Operate" in this

context means being actively involved in the day-to-day management.

E. Subcontract

Subcontract means any agreement, other than one involving an employer-employee relationship, entered into by a Federal Government funding agreement awardee calling for supplies or services required solely for the performance of the original funding agreement.

III. PROPOSAL PREPARATION INSTRUCTIONS AND REQUIREMENTS

A. Limitation on Length of Proposal

In the Program Year 2001, proposals may be submitted either electronically or in hard copy format. (1.)

Please note that:

(1) SBIR Phase I proposals shall not exceed a total of 25 pages (regular size type - no smaller than 10-point font size - single or double spaced, standard 8 1/2" X 11" pages) including proposal cover sheet, budget and all enclosures or attachments.

(2) Attachments, appendices and references are included in the 25-page limitation. Proposals in excess of 25 pages will not be considered for review or award.

Electronic Submission Requirements:

- Each proposal shall not exceed 25 pages
- All proposals must be in all text, ie…no graphics, tables, etc.
- All proposals must be a PDF file attached to e-mail
- No duplicate proposals shall be sent by any other means
- Proposals must be sent via e-mail to: henebury@volpe.dot.gov
- Proposals must be received by 5:00 p.m. on May 1, 2001
- ***You must submit a completed and signed hardcopy of Appendices A, B, and C postmarked no later than May 1st to: Joseph Henebury, DOT SBIR Program Director, DTS-22, U.S. Department of Transportation, Research and Special Programs Administration, John A. Volpe National Transportation Systems Center, 55 Broadway, Kendall Square, Cambridge, MA 02142-1093***
- The proposal file name shall contain eight (8) characters – the first three shall be the topic # you are proposing to, ie…FH3, and the remaining five characters shall be a unique abbreviation of your company's name.

Your proposal will have the same protection/security as DOT e-mail. It will be available to only the team of DOT engineers and/or scientists who are responsible for evaluating your proposal.

If you intend to submit your proposal electronically, you must register at our website: www.volpe.dot.gov/sbir **by April 15, 2001.**

B. Proposal Cover Sheet

Complete the proposal cover sheet in Appendix A as Page 1 of your proposal. All pages shall be numbered consecutively, beginning with the proposal cover sheet.

C. Project Summary

Complete the form in Appendix B as Page 2 of your proposal. The Project Summary shall include a technical abstract with a brief statement of the problem or opportunity, project objectives, and description of the effort. Anticipated results and potential applications of the proposed research shall also be summarized in the space provided. The Project Summary of successful proposals may be published by the DOT and, therefore, shall not contain classified or proprietary information. The technical abstract must be limited to two hundred words in the space provided on the Project Summary form.

D. Technical Content

Submitted proposals must include the following:

(1) **Identification and Significance of the Problem or Opportunity.** The specific technical problem or innovative research opportunity addressed and its potential benefit to the national transportation system shall be clearly stated.

(2) **Phase I Technical Objectives.** State the specific objectives of the Phase I R or R&D effort, including the technical questions it will try to answer to determine the feasibility of the proposed approach.

(3) **Phase I Work Plan.** Describe the Phase I R or R&D plan. The plan shall indicate what will be done, where it will be done, and how the R or R&D will be managed or directed and carried out. Phase I R or R&D shall address the objectives and the questions cited in (2) above. The methods planned to achieve each objective or task shall be discussed in detail, including the level of effort associated with each task.

(4) **Related R or R&D.** Describe significant R or R&D that is directly related to the proposal including any conducted by the project manager/principal investigator or by the proposing firm. Describe how it relates to the proposed effort, and any planned coordination with outside sources. The proposer must persuade reviewers of an awareness of key recent R or R&D conducted by others in the specific topic area.

(5) **Key Personnel and Bibliography of Directly Related Work.** Identify key personnel involved in Phase I including their directly related education, experience, and bibliographic information. Where vitae are extensive, summaries that focus on the most relevant experience or publications are desired and may be necessary to meet proposal page limitations.

(6) **Relationship with Future Research and Development.**

(a) State the anticipated results of the proposed approach if the project is successful (Phase I and Phase II).

(b) Discuss the significance of the Phase I effort in providing a foundation for Phase II research or research and development effort.

(7) **Facilities.** A detailed description, availability and location of instrumentation and physical facilities proposed for Phase I shall be provided.

(8) **Consultants.** Involvement of consultants in the planning and research stages of the project is permitted. If such involvement is intended, it shall be described in detail.

(9) **Potential Applications.** Briefly describe:

(a) Whether and by what means the proposed project appears to have potential commercial application.

(b) Whether and by what means the proposed project appears to have potential use by the federal government.

(10) **Similar Proposals or Awards.** Warning - while it is permissible, with proposal notification, to submit identical proposals or proposals containing a significant amount of essentially equivalent work for consideration under numerous federal program solicitations, it is unlawful to enter into contracts or grants requiring essentially equivalent effort. If there is any question concerning this, it must be disclosed to the soliciting agency or agencies before award.

If a firm elects to submit identical proposals or proposals containing a significant amount of essentially equivalent work under other federal program solicitations, a statement must be included in each such proposal indicating:

(a) The name and address of the agencies to which proposals were submitted or from which awards were received;

(b) Date of proposal submission or date of award;

(c) Title, number, and date of SBIR Program solicitations under which proposals were submitted or awards received;

(d) The applicable research topics for each SBIR proposal submitted or award received;

(e) Titles of research projects; and

(f) Name and title of Project Manager or Principal Investigator for each proposal submitted or award received.

E. Contract Pricing Proposal

A firm fixed price Phase I Contract Pricing Proposal (Schedule 1) must be submitted in detail as shown in Appendix C. Note: Firm Fixed Price (FFP) is the type of contract to be used for Phase I SBIR awards. Some cost breakdown items of Appendix C may not apply to the proposed project. If such is the case, there is no need to provide information for each and every item. It is important, however, to provide enough information to allow the DOT to understand how the proposer plans to use the requested funds if a contract is awarded. Phase I contract awards may include profit.

F. DUNS Identification Number

If available, a firm shall note its Data Universal Numbering System (DUNS) identification number on Appendix C, Contract Pricing Proposal, (Schedule 1). This number is assigned by Dun & Bradstreet, Inc.

G. Acknowledgement of Proposal Receipt

Proposers shall fill out the proposal acknowledgement form and include it with the proposal to DOT.

H. Prior SBIR Phase II Awards

If the small business concern has received more than 15 Phase II awards in the prior 5 fiscal years, submit name of awarding agency, date of award, funding agreement number, amount, topic or subtopic title, follow-on agreement amount, source and date of commitment and current commercialization status for each Phase II. (This required proposal information shall not be counted toward the proposal 25-page count limitation.)

IV. METHOD OF SELECTION AND EVALUATION CRITERIA

A. General

All proposals deemed responsive will be evaluated and judged on a competitive basis. Proposals passing this screening will be evaluated to determine the most promising technical and scientific approaches. Each proposal will be judged on its own merit. The DOT is under no obligation to fund any proposal or any specific number of proposals on a given topic or subtopic. It may elect to fund several or none of the proposed approaches to the same topic or subtopic.

B. Evaluation Criteria

The evaluation process involves the following factors:

(1) Scientific and technical merit and the feasibility of the proposal's commercial potential, as evidenced by:

a) Past record of successful commercialization of SBIR or other research;

b) Existence of second phase funding commitments from private sector or non-SBIR funding sources;

c) Existence of third phase, follow-on commitments; and

d) Presence of other indicators of the commercial potential of the idea.

(2) The adequacy of the work plan and approach to achieve specified work tasks and stated objectives of the proposed effort within budgetary constraints and on a timely schedule.

(3) Qualifications of the proposed principal/key investigator(s) including demonstrated expertise in a disciplinary field related to the particular R or R&D topic that is proposed for investigation.

(4) Adequacy of supporting staff and facilities, equipment, and data for the successful completion of the proposed R or R&D.

C. Prescreening

Each proposal submission will be examined to determine if it is complete and contains an adequate amount of technical and financial data. Proposals that do not meet the basic requirements of the solicitation will be excluded from further consideration. Each proposer will be notified promptly by letter of such action.

D. Schedule

All DOT reviews shall be completed and awards made within 5 months of the closing date for Phase I proposals.

E. Program Selection

A Proposal Review Panel, chaired by the Department's SBIR Program Director and comprising senior management officials representing the Department's Operating Administrations and the Office of the Secretary, will arrange for review and evaluation by professionals, in their respective organizations, of all Phase I proposals that meet the requirements of this solicitation. The Proposal Review Panel will review the technical evaluations by the specialists and recommend to the SBIR Program Director the proposals for award. The SBIR Program Director will announce the awards.

F. Contact with DOT

Contact with DOT relative to this solicitation during the Phase I proposal preparation and evaluation period is restricted for reasons of competitive fairness. Technical questions pertaining to 2001 SBIR solicitation research topics must be submitted to the SBIR Program Office by e-mail: henebury@volpe.dot.gov. Technical questions will be researched and answers provided in as timely a manner as possible. Technical questions submitted to the SBIR Program Office during the few weeks prior to the closing date for receipt of Phase I proposals may not be able to be answered before the closing date.

No information on proposal status will be available until the complete list of 2001 Phase I Award Recommendations to receive funding is posted on the DOT SBIR Program Web Page: www.volpe.dot.gov/sbir/. For planning purposes the notification of 2001 Phase I Award Recommendations is expected to be posted on the DOT SBIR Program Web Page by October 2, 2001. **Phase I proposals which are not included in the October 1st list of 2001 Phase I Award Recommendations will not receive funding. NO WRITTEN CORRESPONDENCE REGARDING PROPOSAL STATUS WILL BE MADE.**

After the 2001 Phase I Award Recommendations are posted on the DOT SBIR Program Web Page, a debriefing comprised of the overall comments on the proposal may be provided to the proposer upon request. Debriefing requests shall be submitted by e-mail to: dohertym@volpe.dot.gov, and must include the proposer's name, address, research topic number, and the proposal identification number assigned on the acknowledgement of receipt card. The identity of the evaluators will not be disclosed.

V. CONSIDERATIONS

A. Awards

It is estimated that during fiscal year 2001, DOT will award approximately 12 Phase I contracts with an anticipated potential maximum of 15 awards, depending on actual funding available and the responses from small business firms to the solicited research topics in Section VIII.

All Phase I awards will be FFP contracts and may be up to $100,000 each unless otherwise noted. Note: Phase II awards anticipate cost-plus-fixed-fee contracts with a value of up to $750,000 each unless otherwise noted. Phase II awardees will be required to have acceptable accounting systems to receive a cost-plus-fixed-fee contract.

Only recipients of Phase I contracts will be eligible to compete for Phase II awards.

DOT's Operating Administrations contribute to SBIR funding. Each Operating Administration's contribution may be used only to support research of concern to that Operating Administration. For example, funds furnished by the Federal Highway Administration may not support research solely of concern to the National Highway Traffic Safety Administration. Based on anticipated funding levels, there may not be adequate funding within the DOT SBIR Program to support Phase I (and Phase II) awards for research which is solely of concern to the following Operating Administrations: Federal Aviation Administration, Federal Highway Administration, Federal Motor Carrier Safety Administration, Federal Railroad Administration, Federal Transit Administration, National Highway Traffic Safety Administration, Research and Special Programs Administration, and/or the U.S. Coast Guard. Phase I (and Phase II) awards for such research will depend on the actual funding available.

B. Reports

Under Phase I SBIR contracts, three reports will be required, consisting of two interim letter reports, and a comprehensive final report.

C. Payment Schedule

Payments for Phase I contracts will be made in three equal installments upon presentation of invoices by the contractor in conjunction with the submission of acceptable reports as described above.

D. Innovations, Inventions, and Patents

1. **Proprietary Information.** Information contained in unsuccessful proposals will remain the property of the proposer. The Government may, however, retain copies of all proposals. Public release of information in any proposal submitted will be subject to existing statutory and regulatory requirements.

If proprietary information is provided by a proposer in a proposal which constitutes a trade secret, proprietary commercial or financial information, confidential personal information or data affecting the national security, it will be treated in confidence, to the extent permitted by law, provided this information is clearly marked by the proposer with the term "confidential proprietary information" and provided the following legend appears on the title page of the proposal:

> "For any purpose other than to evaluate the proposal, these data shall not be disclosed outside the Government and shall not be duplicated, used, or disclosed in whole or in part, provided that if a contract is awarded to this proposer as a result of or in connection with the submission of these data, the Government shall have the right to duplicate, use, or disclose the data to the extent provided in the contract. This restriction does not limit the Government's right to use information contained in the data if it is obtained from another source without restriction. The data subject to this restriction is contained in pages _____ of this proposal."

Any other legend may be unacceptable to the Government and may constitute grounds for return of the proposal without further consideration and

without assuming any liability for inadvertent disclosure. The Government will limit dissemination of such information to within official channels.

The DOT prefers that proposers avoid inclusion of proprietary data in their proposals. If the inclusion of proprietary data is considered essential for meaningful evaluation of a proposal submission, then such data shall be provided on a separate page with a numbering system to key it to the appropriate place in the proposal.

2. **Rights in Data Developed under SBIR Funding Agreements**. Rights in technical data, including software developed under any contract resulting from this solicitation, shall remain with the contractor except that the Government shall have the limited right to use such data for Government purposes and shall not release such data outside the Government without permission of the contractor for a period of four years from completion of the project from which the data were generated. However, effective at the conclusion of the four-year period, the Government shall retain a royalty-free license for federal government use of any technical data delivered under an SBIR contract whether patented or not.

3. **Copyrights**. With prior written permission of the Contracting Officer, the contractor normally may copyright and publish (consistent with appropriate national security considerations, if any) material developed with DOT support. The DOT receives a royalty-free license for the federal government and requires that each publication contain an appropriate acknowledgement and disclaimer statement.

4. **Patents**. Small business firms normally may retain the principal worldwide patent rights to any invention developed with government support. The Government receives a royalty-free license for federal government use, reserves the right to require the patent holder to license others in certain circumstances, and requires that anyone exclusively licensed to sell the invention in the United States must normally manufacture it domestically. To the extent authorized by 35 U.S.C. 205, the government will not make public any information disclosing a government- supported invention for a two-year period to allow the contractor a reasonable time to pursue a patent.

E. Cost-Sharing

Cost-sharing is permitted for Phase II proposals under the topic areas identified in this solicitation; however, cost-sharing is not required nor will it be a factor in proposal evaluations.

F. Profit or Fee

A profit is allowed on awards to small business concerns under the DOT SBIR Program.

G. Joint Ventures or Limited Partnerships

Joint ventures and limited partnerships are permitted provided the entity created qualifies as a small business concern in accordance with the Small Business Act, 15 U.S.C. 631, and the definition included in this solicitation.

H. Research and Analytical Work

1. **For Phase I, a minimum of two-thirds of the research and/or analytical effort must be performed by the proposing firm** unless otherwise approved in writing by the Contracting Officer.

2. **For Phase II, a minimum of one-half of the research and/or analytical effort must be performed by the proposing firm** unless otherwise approved in writing by the Contracting Officer.

I. Contractor Commitments

Upon award of a contract, the awardee will be required to make certain legal commitments through acceptance of numerous contract clauses. The outline that follows is illustrative of the types of clauses to which the contractor would be committed. This list shall not be understood to represent a complete list of clauses to be included in Phase I contracts, nor to be the specific wording of such clauses. Copies of complete terms and conditions are available upon request.

1. **Standards of Work.** Work performed under the contract must conform to high professional standards.

2. **Inspection.** Work performed under the contract is subject to Government inspection and evaluation at all times.

3. **Examination of Records.** The Controller General (or a duly authorized representative) shall have the right to examine any directly pertinent records of the contractor involving transactions related to this contract.

4. **Default**. The Government may terminate the contract if the contractor fails to perform the work contracted.

5. **Termination for Convenience**. The contract may be terminated at any time by the Government if it deems termination to be in its best interest, in which case the contractor will be compensated for work performed and for reasonable termination costs.

6. **Disputes**. Any dispute concerning the contract which cannot be resolved by agreement shall be decided by the Contracting Officer with right of appeal.

7. **Contract Work Hours**. The contractor may not require an employee to work more than eight hours a day or forty hours a week unless the employee is compensated accordingly (i.e., overtime pay).

8. **Equal Opportunity**. The contractor will not discriminate against any employee or applicant for employment because of race, color, religion, sex, or national origin.

9. **Affirmative Action for Veterans**. The contractor will not discriminate against any employee or applicant for employment because he or she is a disabled veteran or veteran of the Vietnam era.

10. **Affirmative Action for Handicapped.** The contractor will not discriminate against any employee or applicant for employment because he or she is physically or mentally handicapped.

11. **Officials Not to Benefit**. No member of or delegate to Congress shall benefit from the contract.

12. **Covenant Against Contingent Fees**. No person or agency has been employed to solicit or secure the contract upon an understanding for compensation except bonafide employees or commercial agencies maintained by the contractor for the purpose of securing business.

13. **Gratuities.** The contract may be terminated by the Government if any gratuities have been offered to any representative of the Government to secure the contract.

14. **Patent Infringement**. The contractor shall report each notice or claim of patent infringement based on the performance of the contract.

15. **Procurement Integrity**. Submission of a proposal under this solicitation subjects the proposer to the procurement integrity provision (§27) of the Office of Federal Procurement Policy Act (41 U.S.C. 423). This statute, as implemented by Federal Acquisition Regulation (FAR, 48 CFR) §3.104, prescribes the following conduct by competing contractors during an agency procurement: offering or discussing future employment or business opportunities with an agency procurement official; promising or offering a gratuity to an agency procurement official; soliciting or obtaining proprietary or source selection information regarding the procurement. Violations of the statute may result in criminal and/or civil penalties, disqualification of a proposer, cancellation of the procurement, or other appropriate remedy.

J. Additional Information

1. This solicitation is intended for informational purposes and reflects current planning. If there is any inconsistency between the information contained herein and the terms of any resulting SBIR contract, the terms of the contract are controlling.

2. Before award of an SBIR contract, the Government may request the proposer to submit certain organizational, management, personnel, and financial information to assure responsibility of the proposer.

3. The government is not responsible for any monies expended by the proposer before award of any contract.

4. This solicitation is not an offer by the government and does not obligate the government to make any specific number of awards. Also, awards under this program are contingent upon the availability of funds.

5. The DOT SBIR Program is not a substitute for existing unsolicited proposal mechanisms. Unsolicited proposals shall not be accepted under the DOT SBIR Program in either Phase I or Phase II. Refer to **www.volpe.dot.gov/procure/unsolguide.html** for specifics on unsolicited proposal submission requirements.

6. If an award is made pursuant to a proposal submitted under this solicitation, the contractor will be required to certify that he or she has not previously been, nor is currently being paid for essentially equivalent work by any agency of the federal government.

7. When purchasing equipment or a product with funds provided under the DOT SBIR Program, purchase only American made equipment and products, to the extent possible in keeping with the overall purposes of the program.

8. In accordance with FAR 52.233-2, Service of Protest, the following Service of Protest procedures shall be followed. Protests, as defined in Section 33.101 of the FAR that are filed directly with an agency, and copies of any protests that are filed with the General Accounting Office (GAO), shall be served on the Contracting Officer (addressed as follows) by obtaining written and dated acknowledgement of receipt from: Mary E. Doherty, DOT/RSPA/Volpe Center, 55 Broadway, Kendall Square, DTS-853, Cambridge, MA 02142-1093.

VI. SUBMISSION OF PROPOSALS

A. Submittal Instructions

For hard copy submissions:

An original and four copies of each proposal submitted under the DOT SBIR Program shall be sent to:

Joseph Henebury
DOT SBIR Program Director, DTS-22
U.S. Department of Transportation
Research and Special Programs Administration
John A. Volpe National
Transportation Systems Center
55 Broadway, Kendall Square
Cambridge, MA 02142-1093
Telephone: (617) 494-2051

Proposals must be postmarked NO LATER than May 1, 2001 to qualify for consideration under the current DOT SBIR Program. Proposals delivered or received via e-mail later than May 1, 2001, 5:00 p.m. will not be accepted.

Proposals delivered to the DOT SBIR Program Office by any means other than the U.S. Postal Service, must be received at the above address on or before May 1, 2001, 5:00 p.m.

Electronic Submission Requirements:

- Each proposal shall not exceed 25 pages
- All proposals must be in all text, ie…no graphics, tables, etc.
- All proposals must be a PDF file attached to e-mail
- No duplicate proposals shall be sent by any other means
- Proposals must be sent via email to: henebury@volpe.dot.gov
- Proposals must be received by 5:00 p.m. on May 1, 2001
- ***You must submit a completed and signed hardcopy of Appendices A, B, and C postmarked no later than May 1st to: Joseph Henebury, DOT SBIR Program Director, DTS-22, U.S. Department of Transportation, Research and Special Programs Administration, John A. Volpe National Transportation Systems Center, 55 Broadway, Kendall Square, Cambridge, MA 02142-1093***
- The proposal file name shall contain eight (8) characters – the first three shall be the topic # you are proposing to, ie…FH3, and the remaining five characters shall be a unique abbreviation of your company's name.

Your proposal will have the same protection/security as DOT e-mail. It will be available to only the team of DOT engineers and/or scientist who is responsible for evaluating your proposal.

If you intend to submit your proposal electronically, you must register at our website:
www.volpe.dot.gov/sbir by April 15, 2001

B. Additional Information

1. **Bindings.** Please do not use special bindings or covers. Staple the pages in the upper left corner of the cover sheet of the proposal with a single staple.

2. **Packaging.** All copies of the proposal shall be sent in one package together with the acknowledgement of receipt which appears on the back cover of this document.

3. **Confirmation.** The DOT SBIR Program Office will assign an identification number to each proposal by May 11, 2001. This number will appear on the proposal acknowledgement which will be sent to the proposer by return mail confirming receipt of the proposal.

   Proposers who submitted their proposals electronically will receive their proposal number via e-mail no later than May 11, 2001.

VII. SCIENTIFIC AND TECHNICAL INFORMATION SOURCES

The following organizations may be sources for providing technology search and/or document services and may be contacted directly for service and cost information:

Center for Technology Commercialization
1400 Computer Drive
Westborough, MA 01581
(508) 870-0042

Great Lakes Industrial Technology Center
25000 Great Northern Corporation Center
Suite 260
Cleveland, OH 44070-5320
(440) 734-0094

Federal Information Exchange, Inc.
555 Quince Orchard Road, Suite 360
Gaithersburg, MD 20878
(301) 975-0103

Southern Technology Applications Center
University of Florida
1900 SW 34th Street, Suite 206
Gainesville, FL 32608
(352) 294-7822

Midcontinent Technology Transfer Center
Texas Engineering Extension Service
The Texas A&M University System
301 Tarrow Street, Suite 119
College Station, TX 77840-7896
(409) 845-8762

National Technical Information Service
5285 Port Royal Road
Springfield, VA 22161
(800) 553-6847

MidAtlantic Technology Applications Center
University of Pittsburgh
3400 Forbes Avenue, 5th Floor
Pittsburgh, PA 15260
(412) 383-2500

Technology Transfer Center
University of Southern California
3716 South Hope Street, Suite 200
Los Angeles, CA 90007-4344
(213) 743-2353

VIII. RESEARCH TOPICS

Phase I research topics for DOT Operating Administrations are listed below. These topics indicate the specific areas for which proposals are to be considered for acceptance by DOT. The topics are not listed in any order of priority. Each proposal must respond to one (and only one) topic as described in this section. A proposal may, however, indicate and describe its relevance to other topics.

DOT OPERATING ADMINISTRATION/TOPICS ..... POTENTIAL MAXIMUM FY01 PHASE I AWARDS

FEDERAL AVIATION ADMINISTRATION (FAA) ..... 6 Awards

01-FA1 Evaluation of Composite Joints in GA Structures

01-FA2 Terahertz Technology Testbed for Aviation Security

01-FA3 Development of Strain Sensors for Unbound Layers (Aggregate and Soil) in Flexible Airport Pavements

01-FA4 Synthesis of Bisphenol C Polycarbonate Ultra Fire Resistant Thermoplastics

01-FA5 Affordable, "Autonomous Navigation System" for General Aviation Aircraft Providing Safety Backup for GPS

01-FA6 Development of Aircraft Wire Testing and Inspection Systems

NATIONAL HIGHWAY TRAFFIC SAFETY ADMINISTRATION (NHTSA) ..... 3 Awards

[1]01-NH1 Improved Tire Inflation Pressure Retention System

[1]101-NH2 Automatic Tire Inflation Maintenance System

[1]01-NH3 Tire Failure Warning Sensor

FEDERAL RAILROAD ADMINISTRATION (FRA) ..... 2 Awards

[2]01-FR1 High Speed Freight Truck Suspension

[2]01-FR2 Safety Glazing Design for Passenger Rail Vehicles

DOT OPERATING ADMINISTRATION/TOPICS ..... POTENTIAL MAXIMUM FY01 PHASE I AWARDS

UNITED STATES COAST GUARD (USCG) ..... 3 Awards

[1]01-CG1 Low Cost Night Vision System for High Speed Vessel Operations

[1]01-CG2 Evaluation of Tidal Power Systems for Remote Sites

[1]01-CG3 Development of Unique Technologies that Prevent Marine Bioadhesion

FEDERAL MOTOR CARRIER SAFETY ADMINISTRATION (FMCSA) ..... 1 Award

[1]01-FM1 Commercial Motor Vehicle (CMV) Driver Assessment Tool

[1]Phase I may be up to $100,000 and Phase II may be up to $300,000
[2]Phase I may be up to $100,000 and Phase II may be up to $250,000

FEDERAL AVIATION ADMINISTRATION

01-FA1 EVALUATION OF COMPOSITE JOINTS IN GENERAL AVIATION (GA) STRUCTURES

There is a need to develop a practical engineering analysis tool for strength, durability, and damage tolerance evaluation of composite bonded joints in General Aviation structure. Analysis method should accommodate configurations, materials, and loading typically found in the General Aviation industry and be simple and conservative enough to be used by General Aviation industry. As composite bonded joints have multiple possible failure modes, the method should be able to predict each mode discretely. In addition, it should provide a means to evaluate disbonds and potential disbond or delamination growth in order to address certification issues. The resulting analysis tool should be compared to existing data at the coupon, element, and subcomponent levels in order to validate the tool for use by industry.

The Phase I research effort will consist of a feasibility study and the investigation of possible techniques for the development of a tool to evaluate composite joints in GA structures. Upon successful completion of Phase I, the actual development of the evaluation tool for composite joints in GA structures would be undertaken in Phase II.

01-FA2 TERAHERTZ TECHNOLOGY FOR AVIATION SECURITY

There is a need to develop a system using Terahertz Technology for the detection of concealed weapons, explosives and incendiary materials which may pose a threat to aviation security.

Terahertz Technology is an emerging "Frontier Technology" which employs electromagnetic waves at extremely high frequencies (10^{11}-10^{13}Hz) and short wavelengths (3mm-30um) for multiple purposes such as high resolution imaging through intervening materials which are normally visually opaque. Terahertz waves can also be used for spectroscopy, i.e. the characterization and identification of materials by illumination and observation of their responses at a range of wavelengths. Previously characterized as being too complex or esoteric, terahertz recently entered the commercial world through the development of standard integrated transmitter, receiver, control, and power assemblies which have eliminated complex custom design and alignment tasks. The emergence of these new systems and components, has opened the door to the potential use of terahertz systems in the detection of concealed weapons, explosives and incendiary materials which may pose a threat to aviation security.

In order to directly assess the potential utility, advantages and risks associated with the employment of terahertz technology as a detection and characterization modality for threat items which may be concealed on persons or in luggage or left in public areas of airports and on aircraft, this effort should entail the following steps:

a. Conceptualize and design a complete terahertz technology research testbed comprising power, control, transmit, receive, compensation and measurement modules and associated signal acquisition and processing instrumentation, using commercially available components. The system design should nominally cover the frequency range of .1 to 2 Terahertz (Thz), with a nominal output power of at least 1mW with a signal-to-noise ratio of approximately 30 db.

b. Integrate components on a standard vibration isolated tapped slab optical table, with suitable optical lab grade quality mounting hardware to allow for reconfiguration for imaging and materials characterization experiments. Computer controlled x-y translation stages and terahertz-focusing optics shall be provided to enable imaging experiments to be made in addition to standard reflectance and absorption spectroscopy measurements.

c. Test, debug and calibrate the terahertz system constructed in the previous phases after delivery to the Federal Aviation Administration Aviation Security Laboratory, using standards and samples mutually acceptable to the Federal Aviation Administration and the SBIR awardee.

d. Provide training, guidance, technical assistance and documentation to Federal Aviation Administration during setup and operation of the terahertz technology testbed as required, particularly during initial weapon detection and energetic materials characterization experiments.

The Phase I research effort will consist of a feasibility study and the investigation of possible techniques for the development of a terahertz technology-based security detection system. Upon successful completion of Phase I, the actual development of the security detection system will be undertaken in Phase II.

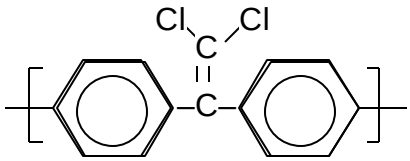
01-FA3 DEVELOPMENT OF STRAIN SENSORS FOR UNBOUND LAYERS (AGGREGATE AND SOIL) IN FLEXIBLE AIRPORT PAVEMENTS

There is a need to develop sensors to measure the strains within the aggregate and subgrade layers of airport pavements. The FAA performs full-scale testing of airport pavements at the National Airport Pavement Test Facility. Approximately fifty percent of the test items are flexible pavements trafficked to complete structural failure with large-scale shear flow occurring in the aggregate and subgrade materials. In order to characterize the performance of the materials, it is desirable to measure the strains within the aggregate and subgrade layers as the performance of the pavement deteriorates from the new condition to complete failure. To fully characterize the response of the pavement under these conditions sensors need to be installed which will measure the strains at arbitrary orientations. The sensors also need to be accurate and reliable over the full range of structural response. The purpose of this project is to develop sensors which meet the above requirements, either as innovative applications of current techniques or using innovative techniques.

Phase I will be to perform a design feasibility study providing design and performance specifications and cost estimates for the sensors. Low-cost sensors are required with the installed cost of a fully developed (production level) sensor less than $2,500.00. Upon successful completion of Phase I, Phase II will be to manufacture and install seven sensors in a flexible pavement at the National Airport Pavement Test Facility for evaluation during a full-scale traffic test to failure.

01-FA4 SYNTHESIS OF BISPHENOL C POLYCARBONATE ULTRA FIRE RESISTANT THERMOPLASTICS

There is a need to develop aircraft cabin materials with an order-of-magnitude lower heat release rate at comparable cost and functionality. It is the object of this project to synthesize kilogram quantities of thermoplastic chloral-based condensation polymers containing a predominance of the 1,1-dichloro, 2,2-bisarylethylene chemical repeat unit (see figure). The advantages of these polymers are their extreme fire resistance, potentially low cost, and their ability to be rapidly fabricated into parts at moderate (< 300 °C) temperatures using conventional plastic processing equipment and techniques.



1,1-dichloro, 2,2-bisarylethylene repeat unit

The condensation reaction of two moles of phenol with one mole of chloral under acidic conditions followed by dehydrochlorination in basic media produces a novel bisphenol: 1,1-dichloro, 2,2-bis (4-hydroxy) ethylene (bisphenol-C/BPC, CAS Registry Number 14868-03-2). Kilogram quantities of the thermoset resins diglycidylether of bisphenol-C (BPC-epoxy) and dicyanate ester of bisphenol-C/BPC have been prepared from BPC and tested for thermal and mechanical properties and flammability. Thermal transitions and mechanical properties of the cured bisphenol-C/BPC thermoset resins are virtually identical to their bisphenol-A analogs. However, when tested as single ply glass lamina in FAR 25.853(a-1), Heat Release Rate Test for Aircraft Cabin Materials, the bisphenol-C/BPC cyanate ester and bisphenol-C/BPC epoxy have peak heat release rate and total heat release which is 10 times lower than the corresponding bisphenol-A thermoset resin, and are well below the FAA requirement of 65 kW/m^2 and 65 kW-min/m^2, respectively. Flame testing of the cyanate ester and the epoxy (cured with an aromatic diamine) reveal self-extinguishing behavior with a limiting oxygen index LOI > 45 and UL 94 V-0/5V. The mechanism for this unusually high fire resistance has been studied by the Federal Aviation Administration and has been ascribed to an *in situ* rearrangement of the 1,1-dichloro, 2,2-bisarylethylene moeity to a stilbene in a fire, followed by the simultaneous production of char in quantitative yield and the elimination of noncombustible gas (i.e., HCl).

Thermoplastic polymers prepared from 1,1-dichloro, 2,2-bis (4-hydroxy) ethylene by condensation reactions have been reported in literature of the 1970's. Two of these bisphenol-C thermoplastics (polycarbonate and polyarylate) have been synthesized recently by the Federal Aviation Administration in gram quantities and have exhibited extremely low heat release rate in microscale combustion tests.

Phase I research should focus on obtaining kilogram quantities of several low-cost condensation polymers derived from 1,1-dichloro, 2,2-bis (4-hydroxy) ethylene and/or directly from chloral and para-substituted diphenyls (e.g., diphenyloxide) in a single step. Emphasis should be on low cost, environmentally friendly synthesis routes. Characterization will include thermal, mechanical, fire, flammability, and environmental testing. Environmental testing will explore light stability and additive approaches to minimize or eliminate color-producing photochemical reactions. Upon successful completion of Phase I, the Phase II effort will downselect to the most promising thermoplastic polymer(s) from the Phase I study for scale-up to >100 kg production for compounding and processing trials (e.g., extrusion, injection molding, fiber spinning) and the production of prototype cabin components for full scale cabin fire testing.

01FA-5 AFFORDABLE, "AUTONOMOUS NAVIGATION SYSTEM" FOR GENERAL AVIATION AIRCRAFT PROVIDING SAFETY BACKUP FOR GLOBAL POSITIONING SYSTEM (GPS)

There is a need to develop a low-cost, back-up, navigation system for use by General Aviation that will provide the capability for continued navigation-should reception of Global Positioning System (GPS) signals be compromised or lost.

Safety of flight concerns dictate that a reliable backup system be developed for flight operations conducted during instrument meteorological conditions. Such a system shall provide stand-alone capability onboard an aircraft without reliance on external signals and provide sufficient accuracy to permit landing to non-precision approach standards.

Development of such a system will assist in the national transition to GPS as the replacement for existing ground navigation systems: Very High Frequency Omni Directional Range (VOR), Distance Measuring Equipment (DME), and Instrument Landing System (ILS). The Federal Aviation Administration is poised to realize significant savings in NAS operating costs by retiring legacy systems now that the GPS navigation system has been approved for civil use. While scheduled airline operations rely on integrated inertial navigation systems and flight management systems, their cost is prohibitive for use by General Aviation interests. A reliable, low-cost Autonomous Navigation System (ANS) that performs similar inertial navigation systems functionality is desired. Additional efforts to physically integrate Autonomous Navigation System with low-cost GPS navigation receiver design would be advantageous.

The Phase I research effort will consist of a feasibility study of a low-cost navigation system for use by General Aviation. Upon successful completion of Phase I, the actual development of the navigation system would be undertaken in Phase II.

01FA-6 DEVELOPMENT OF AIRCRAFT WIRE TESTING AND INSPECTION SYSTEMS

There is a need to develop an aircraft wire testing and inspection system that can identify or characterize the material flaws which may impair the safe and effective transmission of electrical power and signals.

The continued safe operation of aircraft well into their expected service life depends on the safe and effective transfer of power and electrical signals between aircraft electrical components. This in turn requires the verification of wire physical and functional integrity. In circumstances where wire is treated as having an indefinite service life, formal periodic inspections is necessary to ensure its continued safe operation. Even if some wires are eventually subject to a fixed service life, there would still be a need for periodic inspections 1) to ensure the absence of accidental damage, 2) to verify service life estimates, and 3) to confirm the adequacy of maintenance and repair activities on, around, and involving wire.

The proposed systems, technology, and techniques should exhibit potential utility for either infrequent comprehensive examinations or more frequent focused inspections in an airline maintenance environment. The proposal should identify some inspection or testing technology or technique with sensitivity to conditions that correlate well with the hazardous degradation of electrical interconnect systems. Also the proposal should have evidence of endorsement and participation of aircraft manufacturers or operators.

The Phase I research effort will consist of a feasibility study and the investigation of possible techniques for the development of an aircraft wire testing and inspection system. Upon successful completion of Phase I, the actual development of an aircraft wire testing and inspection system would be undertaken in Phase II.

NATIONAL HIGHWAY TRAFFIC SAFETY ADMINISTRATION

[1]01-NH1 IMPROVED TIRE INFLATION PRESSURE RETENTION SYSTEM

The load carrying capability of tires is directly dependent on the tire inflation pressure. Tires that are forced to carry vehicle design loads at reduced tire inflation pressures cannot produce the required lateral/longitudinal forces and soon heat up. Heat destroys the tire materials and the tire bonding agents which can soon lead to tire integrity failure. The problem that has existed in the vehicle fleet for many years, but is becoming even more prevalent today, is tires are continuously losing air pressure and therefore are in continuous need of air inflation pressure maintenance. The tire loses inflation pressure because of the permeability of the inside tire membrane to the passage of air molecules due to the pressure gradient that exists between the inner surface of the tire and the ambient pressure. Many drivers today do not check the tire inflation pressure of their vehicles very often because of the relatively low maintenance requirements that have been designed and built into most of the systems on modern vehicles and because air supply sources are no longer commonly found at service stations.

The assumption is that the use of modern technology can design and produce a tire inner-liner that will greatly reduce the permeability of tires to the passage of air molecules without affecting tire performance and thus insure a greater retention level of tire inflation pressure during normal operation in the vehicle fleet. An improved tire inner-liner may also provide better heat transfer from the tire to the wheel thus allowing the tire to run at a lower temperature. Tires with reduced inflation pressure loss and increased heat transfer capability will greatly reduce the number of under inflated and over heated tires in the vehicle fleet and thus reduce the number of tire failures and resulting fatalities now being experienced on the nation's highways.

Proposals for Phase I research efforts should focus on concepts for the development of such a tire inner liner and should provide a reliable basis for estimating the production cost to achieve this. The actual development of the chosen concept may be pursued in Phase II upon successful completion of Phase I.

[1]01-NH2 AUTOMATIC TIRE INFLATION MAINTENANCE SYSTEM

The load carrying capability of tires is directly dependent on the tire inflation pressure. Tires that are forced to carry vehicle design loads at reduced tire inflation pressures cannot produce the required lateral/longitudinal forces and soon heat up. Heat destroys the tire materials and the tire bonding agents which can soon lead to tire integrity failure. The problem that has existed in the vehicle fleet for many years, but is becoming even more prevalent today, is tires are continuously losing air pressure and therefore are in continuous need of air inflation pressure maintenance. The tire loses inflation pressure because of the permeability of the inside tire membrane to the passage of air molecules from the area of high-pressure inside the tire to the area of low-pressure outside the tire. Many drivers today do not check the tire inflation pressure of their vehicles very often because of the relatively low maintenance requirements that have been designed and built into most of the systems on modern vehicles and because many service stations no longer provide air supply sources to the public.

This requests technology for the design of an automatic tire inflation and maintenance system built into the vehicle that will sense low tire pressure and inflate the tire to the proper level. Such a system can greatly reduce the number

of under inflated tires in the vehicle fleet and thus reduce the number of tire failures and resulting fatalities now being experienced on the nation's highways.

Proposals for Phase I research efforts should focus on concepts for the development of such a tire inflation and maintenance system and should provide a reliable basis for estimating the production cost to achieve this. The actual development of the chosen concept may be pursued in a Phase II upon successful completion of Phase I.

[1]01-NH3 TIRE FAILURE WARNING SENSOR

Tires in the vehicle fleet do not have the capability of warning the driver if the tire is experiencing a "tire failure event", such as tread separation, significant loss of pressure, etc. Sensor technology is rapidly advancing to the point where it may be technically feasible to develop an "in-tire" real time sensor which could warn the driver of an imminent tire failure. Recent advances in sensor technology, wireless technology, and electronics design suggest that development of a tire failure warning sensor system embedded in the tire using emerging technology may now be possible.

This request is based on the assumption that as tire failure mechanisms progress there will be a measurable change in the lateral/longitudinal tire force signature in comparison to the lateral/longitudinal force levels required by the vehicle in maintaining stability. Thus, as a tire fails, the ability of the tire to generate lateral/longitudinal forces as a function of normal load and slip angle will deteriorate. It might be possible to measure this deterioration and reduction in lateral/longitudinal force levels by a stress sensor system embedded into the tire tread area. Emerging technologies might be able to accomplish this goal with a low-cost, low-maintenance design which could be both useful and practical in reducing the number of tire failures caused crashes now being experienced on the nation's highways.

Proposals for Phase I research efforts should focus on concepts for the development of such a stress sensor system and should provide a reliable basis for estimating the production cost to achieve this. The actual development of the chosen concept may be pursued in a Phase II effort upon successful completion of Phase I.

FEDERAL RAILROAD ADMINISTRATION

[2]01-FR1 HIGH SPEED FREIGHT TRUCK SUSPENSION

There is a need to develop a High Speed Freight Truck Suspension for use with Modified Trailers or Freight Cars operating in Passenger Trains or Selected High Speed Rail Freight Service and in Road Haul operation for delivery/pick up.

In the new century there appears to be a growing market for the movement of selected freight in unconventional vehicles attached to high speed passenger trains operating at speeds up to 150 mph. These unconventional vehicles are lightweight in nature, often trailers fitted with running gear including couplers and truck suspensions for road and rail mode operation. A practical truck suspension for ordinary freight cars or special trailers which can be used in both the road and rail modes is needed. The suspension must allow for:

1) easy transfer from road to rail and back to road
2) stowage of unused parts of suspension in a positively locked manner
3) appropriate braking means in both the road and rail modes
4) exceptional ride quality and rail trackability, both empty and loaded
5) safe operation at speeds up to 150 mph

Knowledge of rail industry design, safety, operation and maintenance practices and mechanical design creativity are essential to success. New technologies in compact smart sensors and active suspensions may offer significant improvements in safety and performance.

The Phase I research effort will consist of a feasibility study and the investigation of possible techniques for the development of a high-speed freight truck suspension. Upon successful completion of Phase I, the actual development of the high-speed freight truck suspension would be undertaken in Phase II.

[2]01-FR2 SAFETY GLAZING DESIGN FOR PASSENGER RAIL VEHICLES

There is a need to develop a safety glazing system for use with passenger rail vehicles that would satisfy the safety requirements of the Federal Railroad Administration and the maintenance and other performance requirements of the railroad operators.

In developing the 1999 passenger equipment safety standards of Federal Railroad Administration (published as 49 CFR Part 216 et al, in the Federal Register, vol 64, No. 91, May 12, 1999), there is a conflicting requirement for a stronger system to protect the crew and passengers while in service but also a glazing system that would allow quick egress during emergency evacuation. A new glazing design should use advanced materials, impact sensors, and innovative mounting configuration. The glazing system must allow for:

a. Easy egress of passengers during emergency from inside the vehicle;

b. Easy breakthrough by emergency responders from outside the vehicle during emergency; and

c. Provide adequate protection to the passengers and crew from bullets and other objects throwing to the train from outside.

Knowledge of passenger rail vehicle design, safety operation, and maintenance practices, and creative glazing design are essential to success. Need to determine the appropriate threat to the glazing in the railroad-operating environment. New technologies in compact smart sensors and material properties may offer significant improvements in safety and performance.

The Phase I research effort will consist of a feasibility study and the investigation of possible techniques for the development of a passenger rail vehicle safety glazing system. Upon successful completion of Phase I, the actual development of the safety glazing system would be undertaken in Phase II.

UNITED STATES COAST GUARD

[1]01-CG1 LOW COST NIGHT VISION SYSTEM FOR HIGH SPEED VESSEL OPERATIONS

High-speed, night intercepts have created a need for Coast Guard boat crews, especially the coxswains, to have high quality night vision. A new low cost night vision device is needed that is capable of providing the necessary acuity, depth perception, and situational awareness needed during high-speed maneuvers and intercepts. This system would allow the operator to see the sea state to maneuver safely, and allow for covert operation for high speed intercepts. Non-covert modes of operation may be used for transiting, and search and rescue, and other missions. It is important that the visual information provided by the system not detract from mission performance. These boats are approximately 40 feet in length and can travel at speeds of 50+ miles per hour in harsh environments i.e. seawater and vibration including large and continuous attitude changes. It is envisioned that this system could have wider application across CG boats and could eventually be marketed to recreational boaters for nighttime use, similar in concept to the night vision systems recently available in the automotive industry.

The Phase I research effort will consist of a feasibility study and the investigation of possible techniques for the development of a night vision system. Upon successful completion of phase I, the actual development of the night vision system would be undertaken in Phase II.

[1]01-CG2 EVALUATION OF TIDAL POWER SYSTEMS FOR REMOTE SITES

There is a need for innovative electrical power generation systems using alternative energy sources for remote sites that the Coast Guard operates such as lightstations, radio navigation stations, VHF High Sites, DGPS sites, weather stations and buoys. Severe economic constraints looming in the future such as the cost of petroleum-based fuels, fuel transportation costs and sustained connectivity to the electrical power grid require the consideration of alternative power. Also driving this study are environmental constraints such as exhaust emissions, the potential for spilling petroleum-based fuels, and Federal mandates requiring use of renewable fuels. At many of these remote sites the fuel must be delivered by helicopter, at a prohibitive cost. There is a need to evaluate renewable energy sources that use natural energy available at the site such as solar, wind, and ocean wave and tidal currents.

Many of these sites are located in areas of high tidal ranges such as off the coast of Alaska and Maine, where large tidal currents are present. These areas are also in high latitudes such that solar energy sources are ineffective due to seasonal obscurity of the sun. The technology of generating electricity using natural energy has advanced to the extent that viable generation sources are commercially available and can be adapted to extract energy from moving seawater in tidal currents. These technologies use solid state semiconductor technologies where there are no moving parts, and have a much greater reliability than previous systems utilizing impellers and rotors.

The desired product is an electrical generation system with no moving parts that is capable of generating and storing electricity utilizing moving seawater. This system shall also be designed for long sustained operation and resistant to degrading factors in the marine environment such as corrosion and accumulation of fouling of marine life. Nominal requirements are for generation and storage of 10 kWh/day of electrical energy at a location with a 2-knot diurnal sinusoidal flow. The system must be capable of emplacement at a selected test site using conventional techniques, and continued operation for a period of one year without servicing.

The Phase I research effort will consist of a feasibility study and the investigation of possible techniques for the development of an alternative energy electrical power generation system. Upon successful completion of Phase I, the actual development of the electrical power generation system would be undertaken in Phase II.

[1]01-CG3 DEVELOPMENT OF UNIQUE TECHNOLOGIES THAT PREVENT MARINE BIOADHESION

Successful invasions of aquatic nuisance species have increased at a significant rate over the last several decades resulting in unexpected harmful impacts. These organisms are transported by ship hulls and in ship ballast water. The risk of translocation of exotic marine species via hull fouling may be greater than that associated with ballast water discharge. Two separate studies on invasive species found hulls to be the greater source of introduction for invasive species. One study by the Institute for Marine Studies in Kiel found that between 1992 and 1995, two thirds of the aquatic nuisance species with the highest potential for establishment were from bioadhesive organisms. Bioadhesive organisms are tractable organisms that grow on underwater surfaces, such as hulls of ships.

The National Invasive Species Act of 1996 (NISA) (Pub. L. 104-332) directs the Secretary of Transportation to promulgate guidelines for management practices that will reduce the probability of introductions from ship operations other than ballast water discharge (1101(c)(2)(E)(i). Therefore, the United States Coast Guard needs to conduct baseline research on marine bioadhesive patterns, and on methods for reducing introductions via bioadhesion.

Preliminary investigations determined the existence of technologies, which have the potential to prevent bioadhesion, such as antifouling paints. It is therefore the desire of the USCG to design, model, and develop techniques such as these so that they may be commercially feasible to use by ships or other facilities to reduce the invasions of ANS by bioadhesion.

The Phase I research effort would consist of a feasibility study and the in-depth investigation of the techniques described above for the development of alternative methods capable of preventing bioadhesion. Upon the successful completion of Phase I, the actual development of the alternative selected to prevent bioadhesion may be undertaken in Phase II.

FEDERAL MOTOR CARRIER SAFETY ADMINISTRATION

[1]01-FM1 COMMERCIAL MOTOR VEHICLE (CMV) DRIVER ASSESSMENT TOOL

There is a need to develop a fast, low-cost, portable assessment tool to measure basic CMV cognitive skills, performance, and behaviors relevant to safe CMV driving. For example, a 30-to 45-minute PC-based simulation might provide drivers with traffic situations calling for safe vehicle control, defensive driving, crash threat recognition, reaction to threat, decision-making, and execution of evasive maneuvers. The envisioned tool would not be a high-fidelity simulation of the physical driving environment, but rather would focus on assessing cognitive/behavioral performance traits and behaviors relevant to safe CMV driving. As such, it would likely be an analog to driving. The principal applications of this device would be for motor carriers to improve their CMV driver selection processes and, additionally, to improve the safety performance assessment and improvement of current drivers. There may also be research applications of the device. The most important consideration regarding such devices is validity, i.e., demonstration of content, construct, concurrent, and/or predictive validity in identifying safe and unsafe drivers and/or measuring key behavioral parameters of driving safety.

The Phase I research effort will consist of a feasibility study and the investigation of possible techniques for the development of a CMV driver assessment tool. Upon successful completion of Phase I, the actual development of the CMV driver assessment tool would be undertaken in Phase II.

[1]Phase I may be up to $100,000 and Phase II may be up to $300,000
[2]Phase I may be up to $100,000 and Phase II may be up to $250,000

IX. SUBMISSION FORMS AND CERTIFICATIONS

1.	PROPOSAL COVER SHEET	Appendix A
2.	PROJECT SUMMARY	Appendix B
3.	CONTRACT PRICING PROPOSAL	Appendix C
4.	PROPOSAL CHECKLIST	
5.	PROPOSAL ACKNOWLEDGEMENT FORM	

APPENDIX A

U.S. DEPARTMENT OF TRANSPORTATION

SMALL BUSINESS INNOVATION RESEARCH PROGRAM
SOLICITATION NO. DTRS57-01-R-SBIR

PROPOSAL COVER SHEET

Project Title _____

Research Topic No. _____ Research Topic Title _____

Submitted by
Name _____

Address _____

City _____ State _____ Zip + _____

Amount Requested (Phase I) $ _____ Proposed Duration _____
(May be up to $100,000 unless otherwise indicated) (in months) (Not to exceed six months)

1. The above concern certifies it is a small business firm and meets the definition stated in section 11B; and that it meets the eligibility requirement in Section 1C. Yes_____ No_____

2. The above concern certifies it _____does_____does not qualify as a minority and disadvantaged small business as defined in IIC. (For statistical purposes only.)

3. The above concern certifies it_____does_____does not qualify as a women-owned small business as defined in IID. (For statistical purposes only.)

4. This firm and/or Principal Investigator has submitted proposals containing a significant amount of essentially equivalent work under other federal program solicitations, or has received other federal awards containing a significant amount of essentially equivalent work. (If yes, identify proposals in the section III. D. 10. "Similar Proposals or Awards".) Yes_____ No_____

5. Will you permit the Government to disclose the title and technical abstract of your proposed project, plus the name, address, and telephone number of the Corporate Official and Principal Investigator of your firm, if your proposal does not result in an award, to any party that may be interested in contacting you for further information? Yes_____ No_____

Principal Investigator
Name _____
Title _____
Signature_____Date_____
Telephone No._____

Corporate/Business Official
Name _____
Title _____
Signature_____Date____
Telephone No._____

PROPRIETARY NOTICE (IF APPLICABLE, SEE SECTION V.D.1)

APPENDIX B

U.S. DEPARTMENT OF TRANSPORTATION

SMALL BUSINESS INNOVATION RESEARCH PROGRAM
SOLICITATION NO. DTRS57-01-R-SBIR

PROJECT SUMMARY

Name and Address of Proposer	**FOR DOT USE ONLY**
	Proposal No.

Name and Title of Principal Investigator

Project Title

Research Topic No.	Research Topic Title

Technical Abstract (Limited to two hundred words in this space only with no classified or proprietary information/data)

Anticipated Results/Potential Commercial Applications of Results

Provide key words (8 maximum) description of the project useful in identifying the technology, research thrust and/or potential commercial application.

U.S. DEPARTMENT OF TRANSPORTATION
SMALL BUSINESS INNOVATION RESEARCH PROGRAM
SOLICITATION NO. DTRS57-01-R-SBIR

APPENDIX C
(SCHEDULE 1)

CONTRACT PRICING PROPOSAL

PROPOSAL COVER SHEET			1. SOLICITATION/CONTRACT/MODIFICATION NUMBER			
2a. NAME OF OFFEROR			3a. NAME OF OFFEROR'S POINT OF CONTACT			
2b. FIRST LINE ADDRESS			3b. TITLE OF OFFEROR'S POINT OF CONTACT			
2c. STREET ADDRESS			3c. TELEPHONE		3c. FACSMILIE	
2d. CITY	2e. STATE	2f. ZIP CODE	AREA CODE	NUMBER	AREA CODE	NUMBER
4. TYPE OF CONTRACT OR SUBCONTRACT *(Check)* ☐ FFP ☐ CPFF ☐ CPIF ☐ CPAF ☐ FPI ☐ OTHER *(Specify)*			5. ☐ PRIME OFFEROR ☐ SUBCONTRACTOR _____ PRIME OFFEROR'S NAME			

6. ESTIMATED COST, FEE AND PROFIT INFORMATION

A. ESTIMATED COST

B. FIXED FEE

C. AWARD FEE

D. PROFIT

E. TOTAL PRICE

7. PROVIDE THE FOLLOWING

NAME OF COGNIZANT CONTRACT ADMINISTRATIVE AGENCY				NAME OF COGNIZANT GOVERNMENT AUDIT AGENCY			
STREET ADDRESS				STREET ADDRESS			
CITY		STATE	ZIP CODE	CITY		STATE	ZIP CODE
TELEPHONE	AREA CODE	NUMBER		TELEPHONE	AREA CODE	NUMBER	
FACSIMILE	AREA CODE	NUMBER		FACSIMILE	AREA CODE	NUMBER	
NAME OF CONTACT				NAME OF CONTACT			
PROPERTY SYSTEM ☐ Reviewed by cognizant contract administrative agency and determined acceptable ☐ Reviewed by cognizant contract administrative agency and determined not acceptable ☐ Never reviewed				APPROXIMATE DATE OF LAST AUDIT PURPOSE OF AUDIT (e.g. proposal review, establishment of billing rates, finalize indirect rates, etc.)			
PURCHASING SYSTEM ☐ Reviewed by cognizant contract administrative agency and determined acceptable ☐ Reviewed by cognizant contract administrative agency and determined not acceptable ☐ Never reviewed				ACCOUNTING SYSTEM ☐ Audited and determined acceptable ☐ Audited and determined not acceptable ☐ Never audited OFFEROR'S FISCAL YEAR			
8a. NAME OF OFFEROR *(Typed)*				9. NAME OF FIRM			
8b. TITLE OF OFFEROR *(Typed)*							

10. SIGNATURE	11. DATE OF SUBMISSION

U.S. DEPARTMENT OF TRANSPORTATION
SMALL BUSINESS INNOVATION RESEARCH PROGRAM

CONTRACT PRICING PROPOSAL

Background

The following items, as appropriate, shall be included in proposals responsive to this Solicitation.

Cost Breakdown Items (in this order, as appropriate); (See Section III.E)

1. Name of proposer
2. Address of proposer
3. Location where work will be performed
4. Proposer's Project Title
5. Research topic number and title from DOT SBIR Program Solicitation
6. Total dollar amount of the proposal (dollars)
7. Direct material costs
   a. Purchased parts (dollars)
   b. Subcontracted items (dollars)
   c. Other
      (1) Raw materials (dollars)
      (2) Standard commercial items (dollars)
   d. Total direct materials (dollars)
8. Material overhead rate _____ % x total direct material = dollars
9. Direct labor (specify)
   a. Type of labor, estimated hours, rate per hour and dollar cost for each type
   b. Total estimated direct labor (dollars)
10. Labor overhead
    a. Identify overhead rate, the hour base and dollar cost
    b. Total estimated labor overhead (dollars)
11. Special testing (include field work at Government installations)
    a. Specify each item of special testing, including estimated usage and unit cost
    b. Estimated total special testing (dollars)
12. Other special equipment
    a. If direct charge, specify each item of special equipment, including usage and unit cost
    b. Estimated total other special equipment (dollars)

13. Travel (if direct charge)
    a. Transportation (detailed breakdown and dollars)
    b. Per diem or subsistence (details and dollars)
    c. Estimated total travel (dollars)
14. Consultants Service
    a. Identify each consultant, including purpose and dollar rates
    b. Total estimated consultant service costs (dollars)
15. Other direct costs (specify)
    a. Total estimated direct cost and overhead (dollars)
16. General and administrative expense
    a. Percentage rate applied
    b. Total estimated cost of G&A expense (dollars)
17. Royalties (specify)
    a. Estimated cost (dollars)
18. Fee or profit (dollars)
19. Total estimated cost and fee or profit (dollars)
20. The cost breakdown portion of a proposal must be signed by a responsible official of the firm (include typed name and title and date of signature).
21. Provide a yes or no answer to each of the following questions:
    a. Has any executive agency of the United States Government performed any review of your accounts or records in connection with any other government prime contract or subcontract within the past twelve months? If yes, provide the name and address of the reviewing office, name of the individual and telephone/extension.
    b. Will you require the use of any government property in the performance of this proposal? If yes, identify.
    c. Do you require government contract financing to perform this proposed contract? If yes, specify type as advanced payments or progress payments.
22. Type of contract proposed, firm-fixed price.
23. DUNS number, if available_____
    (See Section III.F)
24. Tax Identification Number, if available.

U.S. DEPARTMENT OF TRANSPORTATION

SMALL BUSINESS INNOVATION RESEARCH PROGRAM
SOLICITATION NO. DTRS57-01-R-SBIR

PROPOSAL CHECKLIST

This is a CHECKLIST OF REQUIREMENTS for your proposal. Please review the checklist carefully to assure that your proposal meets the DOT SBIR requirements. Failure to meet these requirements may result in your proposal being returned without consideration. (See Sections III and IV.C of this Solicitation). Do not include this checklist with your proposal.

____ 1. The proposal reflects the fact that for Phase I a minimum of two-thirds (and for Phase II a minimum of one-half) of the research and/or analytical effort will be performed by the proposing firm as required (see Sections V.H.1 and V.H.2) and the primary employment of the principal investigator (for both Phase I and Phase II) must be with the small business firm at the time of award and during the conduct of the proposed research as required (see Section 1.C).

____ 2. The proposal is 25 PAGES OR LESS in length. This limitation does not apply to the additional information required by Section III.H.

____ 3. The proposal is limited to only ONE of the research topics in Section VIII.

____ 4. The proposal budget may be up to $100,000 unless otherwise indicated and duration does not exceed six months.

____ 5. The technical abstract contains no proprietary information, does not exceed 200 words, and is limited to the space provided on the Project Summary sheet (Appendix B).

____ 6. The proposal contains only pages of 8 1/2" x 11" size.

____ 7. The proposal contains no type smaller than 10 point font size (except as legend on reduced drawings, but not tables).

____ 8. The COVER SHEET (Appendix A) has been completed and is PAGE 1 of the proposal.

____ 9. The PROJECT SUMMARY (Appendix B) has been completed and is PAGE 2 of the proposal.

____ 10. The TECHNICAL CONTENT of the proposal begins on PAGE 3 and includes the items identified in SECTION III.D of the Solicitation.

____ 11. The Contract Pricing Proposal (Appendix C) has been included as the last section of the proposal.

____ 12. The acknowledgement of proposal receipt on the back cover of the solicitation shall be detached, filled out and included with the proposal package.

____ 13. An original and four copies of the proposal are submitted.

____ 14. The additional information on prior Phase II awards, if required, in accordance with Section III.H.

____ 15. The proposal must be postmarked (or delivered to the DOT SBIR Program Office by 5:00 p.m.) no later than May 1, 2001 as required (see Section VI.A). If submitted electronically, the proposal must be received by May 1, 2001, 5:00 p.m.

DOT SBIR PROGRAM SOLICITATION
DTRS57-01-R-SBIR

TO BE FILLED OUT BY THE PROPOSER:

Project Title _____

_____

TO BE FILLED OUT BY THE DEPARTMENT OF TRANSPORTATION:

Date Received _____ Proposal No. _____

The form for acknowledging receipt of proposal appears above. Please include it in the same package with the proposal submitted to DOT and provide your address on the reverse side.